

19. (New) The device of claim 15, further comprising a current diffusion layer located between at least the light-emitting layer and the semiconductor having the top surface that is roughened, and an etch stop layer provided between the current diffusion layer and said semiconductor layer having the top surface that is roughened.

20. (New) The device of claim 15, wherein the device includes only one DBR.

REMARKS

This is in response to the Office Action dated March 31, 2003. New claims 19-20 have been added. Thus, claims 1-8 and 15-20 are now pending. Attached hereto is a marked-up version of the changes made to the claim(s) by the current amendment. The attached page(s) is captioned "Version With Markings To Show Changes Made."

Claim 1 stands rejected under 35 U.S.C. Section 103(a) as being allegedly unpatentable over Krames, Saeki and Vakhshoori, considered together. This 3-way Section 103(a) rejection is respectfully traversed for at least the following reasons.

Claim 1 as amended requires "a DBR (Distributed Bragg Reflector) and a light-emitting layer supported by at least a substrate comprising GaAs, the DBR being located between the substrate comprising GaAs and the light-emitting layer, wherein light directed from the light-emitting layer toward a top surface of the light-emitting device has a radiation angle dependence; a semiconductor layer formed over at least the light-emitting layer, a top surface of the semiconductor layer comprising a roughened surface

which is at least partially uncovered and exposed to surrounding atmosphere in order to cause light output from the light-emitting device to be diffused upon leaving the top surface of the device; and wherein no DBR is provided between the light-emitting layer and the semiconductor layer having the top surface that is roughened."

Vakhshoori is entirely unrelated to the invention of claim 1. In particular, claim 1 as amended requires that the top surface of the semiconductor layer is at least partially roughened in a manner which causes "light output from the light-emitting device to be diffused upon leaving the top surface of the device." Vakhshoori teaches the opposite of claim 1 in this respect. Instead of causing output light to be diffused as called for in claim 1, Vakhshoori uses a type of roughness for the express purpose of causing output light to be focused (see Fig. 2; col. 1, lines 50-55; and col. 3, line 55). Thus, it can be seen that Vakhshoori teaches direction away from the invention of amended claim 1 and is unrelated to the same.

Krames is also unrelated to the invention of amended claim 1. In particular, claim 1 as amended requires that "no DBR is provided between the light-emitting layer and the semiconductor layer having the top surface that is roughened." Krames fails to disclose or suggest this aspect of claim 1. Fig. 13 of Krames sandwiches a light emitting layer 2 between a pair of DBRs. Fig. 14 of Krames also requires a DBR 22 over the light emitting layer 2. Thus, it can be seen that all DBR embodiments of Krames use at least one DBR located over the light emitting layer so as to be provided between the light emitting layer and an overlying layer with surface roughness. This requirement of Krames is the opposite of what amended claim 1 requires. Krames teaches directly away

from the requirement of amended claim 1 that "no DBR is provided between the light-emitting layer and the semiconductor layer having the top surface that is roughened" and is entirely unrelated to claim 1 in at least this respect.

Saeki also is unrelated to amended claim 1. In particular, Saeki clearly fails to disclose or suggest the requirement of amended claim 1 that "a top surface of the semiconductor layer comprising a roughened surface which is at least partially *uncovered and exposed to surrounding atmosphere* in order to cause light output from the light-emitting device to be diffused upon leaving the top surface of the device." Saeki teaches directly away from this aspect of claim 1, as Saeki requires many layers over top of the roughened portion in Fig. 8B.

It can also be seen that no reasonable combination under Section 103 could possibly be made which could meet amended claim 1 based on the art of record. In short, the art of record fails to disclose or suggest the invention of amended claim 1, either alone or in combination.

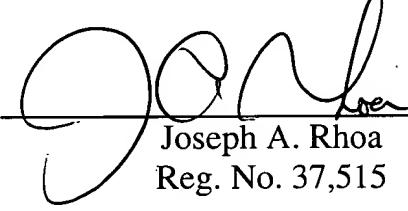
Claim 15 calls for "a DBR (Distributed Bragg Reflector) and a light-emitting layer supported by a substrate comprising GaAs, the DBR being located closer to the substrate comprising GaAs than is the light-emitting layer; and a semiconductor layer formed on the light-emitting layer, and wherein at least part of a top surface of the semiconductor layer is roughened so as to define a roughened surface which is at least partially uncovered and exposed in order to cause light output from the light-emitting device to be diffused upon leaving the top surface of the device; and wherein no DBR is provided between the light-emitting layer and the semiconductor layer having the top surface that

is roughened." The cited art fails to disclose or suggest these aspects of amended claim 15.

For at least the foregoing reasons, it is respectfully requested that all rejections be withdrawn. All claims are in condition for allowance. If any minor matter remains to be resolved, the Examiner is invited to telephone the undersigned with regard to the same.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 

Joseph A. Rhoa

Reg. No. 37,515

JAR:caj
1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

1. (Amended) A semiconductor light-emitting device [having]comprising:
a DBR (Distributed Bragg Reflector) and a light-emitting layer [formed
on]supported by at least a [GaAs]substrate comprising GaAs, the DBR being located
between the [GaAs]substrate comprising GaAs and the light-emitting layer, [in
which]wherein light directed from the light-emitting layer toward a top surface of the
light-emitting device has a radiation angle dependence[, the semiconductor light-emitting
device further comprising:];
a semiconductor layer [having a number of layers of 1 or more is]formed [on]over
at least the light-emitting layer, a top surface of the semiconductor layer
[being]comprising a roughened surface which is at least partially uncovered and exposed
to surrounding atmosphere in order to cause light output from the light-emitting device to
be diffused upon leaving the top surface of the device; and
wherein no DBR is provided between the light-emitting layer and the
semiconductor layer having the top surface that is roughened.

15. (Amended) A semiconductor light-emitting device comprising:
a DBR (Distributed Bragg Reflector) and a light-emitting layer supported by a
substrate comprising GaAs, the DBR being located closer to the substrate comprising
GaAs than is the light-emitting layer; and

a semiconductor layer [having a number of layers of 1 or more]formed on the light-emitting layer, and wherein at least part of a top surface of the semiconductor layer is roughened so as to define a roughened surface which is at least partially uncovered and exposed in order to cause light output from the light-emitting device to be diffused upon leaving the top surface of the device; and

wherein no DBR is provided between the light-emitting layer and the semiconductor layer having the top surface that is roughened.

Please add the following new claims:

19. (New) The device of claim 15, further comprising a current diffusion layer located between at least the light-emitting layer and the semiconductor having the top surface that is roughened, and an etch stop layer provided between the current diffusion layer and said semiconductor layer having the top surface that is roughened.

20. (New) The device of claim 15, wherein the device includes only one DBR.